PRODUCTION AND STORAGE FACILITIES FOR FROZEN FRUITS AND VEGETABLES IN CANADA

L.E. Drayton and D.W. Ware

Economics Division

Marketing Service

Canada Department of Agriculture

[Ottawa]

58/8

April, 1958

ACKNOWLEDGMENTS

This study has been made possible by the co-operation of firms which process frozen fruits and vegetables. Every firm contacted willingly supplied the requested information.

The Fruit and Vegetable Division, and the Transportation, Storage and Retail Section of the Department of Agriculture assisted in planning the study and critical review of the report. Several of the canning inspectors provided considerable assistance in the collection of data. The Dominion Bureau of Statistics assisted in the assembly and checking of statistics used.

The co-operation of all these parties is greatly appreciated.

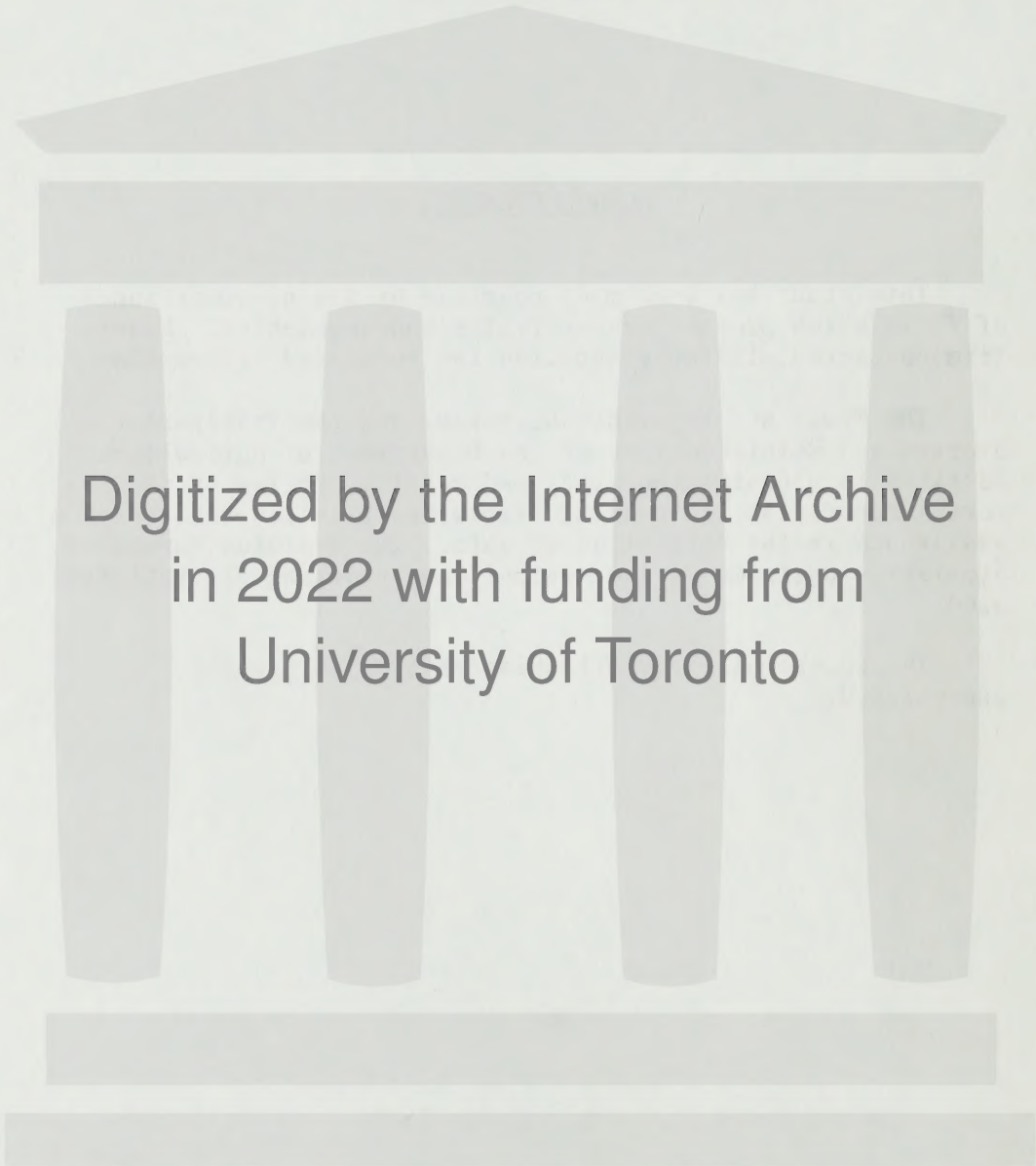

TABLE OF CONTENTS

Production and Storage Facilities for Frozen Fruits and Vegetables in Canada

SUMMARY

1. In 1955 Canadian production of frozen fruits and vegetables attained a record level of 57 million pounds. However, in 1956 smaller fruit crops led to a decline of ten million pounds in frozen fruit production. Frozen vegetable production has continued to increase.

2. The leading frozen fruits and vegetables packed in Canada in 1956 were, in order of importance: peas, strawberries, corn, cherries, raspberries, french fried potatoes, beans and blueberries. These products together with apples have accounted for over 90 per cent of the total pack in each of the last three years.

3. The leading province for packing frozen fruits and vegetables is British Columbia followed by Ontario and Alberta.

4. The number of firms packing frozen fruits and vegetables increased from 64 in 1952 to 92 in 1956. Over a third of these firms are in Ontario.

5. Over two-thirds of Canadian packers of frozen fruits and vegetables have an annual output of less than half a million pounds each. On the other hand, 12 firms had a pack of over one million pounds each and accounted for over 60 per cent of the 1956 output.

6. Packers of frozen vegetables, other than french fried potatoes, buy most of their raw material under acreage contracts. However, a considerable portion of the vegetables used is grown on land that is either owned or rented by the packer. A different type of contract is used for the purchase of berries as the grower usually retains the right to sell a portion of his product on the fresh market. Cherries in Ontario are bought under a marketing board contract. Blueberries, apples and potatoes are often bought on the open market from wholesale suppliers.

7. Quality requirements of raw material for freezing are generally similar to those for canning. However, with peas, different varieties are used.

8. The processing season for individual canning and berry crops and cherries is about four to six weeks. However, the seasons for the main products frozen tend to follow a sequence so that a firm freezing a variety of fruits and vegetables can operate continuously for from two to four months. This operating season may be extended by packing and freezing apples, french fried potatoes and prepared foods.

9. Even within the short processing season available to most firms the flow of supply of raw material is not uniform but rises to a sharp peak and then declines. Consequently, most packers are unable to operate at levels higher than 80 per cent of their daily capacity for more than a few days a year.

10. About half of the Canadian frozen fruit and vegetable pack is prepared for freezing in one plant and frozen in another. This practice is more prevalent for fruits than for vegetables - especially when intended for reprocessing.

11. Those packers who freeze fruits and vegetables in public cold storage warehouses usually store in the same warehouse until the product is used or sold. Some of the packers who have their own freezing plants also rent public cold storage space.

12. Canada's capacity to produce varies considerably among the leading fruits and vegetables frozen. Canada can easily produce an exportable surplus of apples, blueberries and potatoes. On the other hand, Canada has consumed more fresh strawberries and cherries in recent years than she has produced. Production of peas, beans, corn and raspberries differs little from domestic consumption over a series of years.

13. Capacity to prepare fruits and vegetables for freezing is difficult to measure but does not appear to limit the total Canadian pack of frozen fruits and vegetables.

14. Freezing capacity readily accessible to packers may well have limited the pack in recent years.

15. Storage capacity available for frozen fruits and vegetables is difficult to measure in view of competing demands on public cold storage space, but appeared to be ample for 1955 requirements.

16. Certain marketing problems have tended to curb expansion of the Canadian frozen fruit and vegetable industry. The most serious of these appear to be related to the cost of transportation from packing plant to ultimate market and the cost of distribution to retailers. Shortage of retail store cabinet space for frozen foods also leads to marketing difficulties.

17. There are strong indications that the production of frozen fruits and vegetables in Canada will continue to expand at a rapid rate during the next few years.

18. Per capita consumption of frozen fruits and vegetables has increased rapidly in Canada in recent years but is still much lower than in the U.S.A.

19. Canada imported over 13 million pounds of frozen fruits and over 24 million pounds of frozen vegetables in the 1956-57 crop year. These imports were the largest on record. Imports had been relatively small a few years earlier when Canadian output was much lower. Exports of frozen fruits, other than blueberries, and of frozen vegetables are negligible.

20. Longer production seasons, larger scale of operation and lower machinery costs give American packers some advantage over Canadian

packers. Also packers in Western Canada pay higher transportation charges to reach Central Canadian markets than are paid by packers in the Western states. But Canadian packers have offsetting advantages of lower wage rates and tariff protection.

INTRODUCTION

Thirty years ago few Canadians believed that it was practicable to preserve fruits and vegetables by freezing them. Nevertheless, by the early 1920's some Canadian firms were packing fruits, especially strawberries, with sugar in bulk containers and holding them frozen in storage until required for reprocessing into jam. Some years later frozen berries were offered to institutional users and to housewives through retail stores. Meanwhile, experimentation was proceeding with frozen vegetables. By 1935 a variety of frozen fruits and vegetables was available in some retail stores.

Today, frozen food counters with considerable space devoted to fruits and vegetables have become standard equipment in the larger grocery stores. Farm value of fruits and vegetables sold to processors for freezing runs to several million dollars each year and continues to increase. However, Canadian processors of frozen fruits and vegetables are failing to meet the growing demand. Before 1951, Canadian exports of frozen fruits usually exceeded imports. During 1956 imports exceeded one-third of domestic requirements. Likewise, imports of frozen vegetables increased from 1.1 million pounds in 1951 to 24.9 million pounds in 1956.

The current study was undertaken in 1955 to obtain information on the present state of development of the frozen fruit and vegetable industry in Canada. It is based on interviews with the managerial staff of 57 processing firms supplemented by data published by the Dominion Bureau of Statistics.

Volume of pack.- Data are available on the total pack of frozen fruits since 1938 and of frozen vegetables since 1943. These data reveal a rapid but somewhat erratic expansion of the industry during this period (Table 1). Wartime conditions prevented rapid expansion of the industry from 1939-45. It was difficult to secure equipment to expand production facilities during most of this period. Moreover, facilities for marketing frozen fruits and vegetables and for their home storage were very limited. Even the use of frozen fruit in jam manufacture was discouraged as a result of sugar rationing.

A very rapid expansion of the frozen fruit and vegetable industry followed the lifting of wartime restrictions. Indeed by 1950, the industry appeared to have reached a plateau in its development; some firms experienced difficulty in marketing their output that year.

Late in 1952 the aggressive selling of home freezers through food plans developed in Canada. This proved very beneficial to the packers of frozen fruits and vegetables. Buyers of home freezers have to become heavy users of a wide variety of frozen foods to realize the full benefit of their investment. Moreover, this sales campaign has made the public more conscious of frozen foods.

Table 1.- Production of frozen fruits and vegetables 1938-56

Year	Fruits	Vegetables
	- thousand pounds -	
1938	3,347	-
1939	3,358	-
1940	5,512	-
1941	5,595	-
1942	6,031	-
1943	4,990	3,393
1944	4,605	3,058
1945	4,583	3,359
1946	11,634	4,757
1947	10,374	6,521
1948	19,083	8,980
1949	15,125	10,717
1950	16,962	16,156
1951	13,069	12,392
1952	15,729	14,475
1953	23,235	20,720
1954	29,591	18,360
1955	27,840	28,551
1956	17,614	32,497

Source: Dominion Bureau of Statistics.

Some other factors have helped the expansion of the frozen food industry in recent years. Facilities for marketing frozen foods through retail stores have expanded rapidly. Moreover, most of the more recent models of domestic refrigerators have a much larger frozen food compartment than was prevalent even as recently as 1950.

A sharp decline in the production of frozen fruits occurred in 1956. This was the result of a severe frost in British Columbia in November 1955. This frost destroyed the greater part of the strawberry plantations of the lower Fraser Valley and reduced yields of other small fruits. Consequently, considerable importation of fresh berries was necessary to achieve even the greatly reduced pack of 1956.

Products packed.- Frozen fruits packed in Canada include strawberries, raspberries, cherries, blueberries, apples, rhubarb, peaches, plums, loganberries and blackberries. Frozen vegetables packed include peas, corn, green beans, wax beans, squash, carrots, lima beans, broccoli, cauliflower and french fried potatoes. The Dominion Bureau of Statistics receives reports from individual firms on the pack of all these fruits and vegetables. However, data are published only on the pack of those which are processed by three or more firms. Quantities packed of other fruits and vegetables are included in published total packs.

Fruits.- Strawberries are the leading frozen fruit packed in Canada and have gained in relative importance during the last three years (Table 2).

They account for over a third of the total frozen fruit pack in recent years. It would appear that about half the strawberries which are frozen are used for jam manufacture and other reprocessing uses. The reported pack for reprocessing in 1954 and 1955 was less than half of the total pack, but substantial quantities were packed in containers of over one pound but under 30 pounds. It is likely that much of this fruit was reprocessed.

Table 2.- Packs of specific frozen fruits and vegetables in Canada, 1954 to 1957

	Year			
	1954	1955	1956	1957
	- thousand pounds -			
Apples	927	1,671	a/	b/
Blueberries	3,800	2,484	1,517	b/
Cherries	7,271	5,649	3,865	b/
Raspberries	6,973	5,906	3,581	9,437
Strawberries	9,327	10,794	7,096	9,605
Other fruits	1,293	1,336	1,555	b/
Total fruits	29,591	27,840	17,614	b/
Beans, green	2,101	2,164	2,570	3,308
Beans, wax	116	98	238	352
Corn	1,980	3,401	4,629	5,453
Peas	11,607	19,051	20,010	22,243
French fried potatoes	1,144	1,895	3,237	b/
Other vegetables	1,411	1,943	1,813	b/
Total vegetables	18,359	28,552	32,497	b/
Total fruits and vegetables	47,950	56,392	50,111	b/

Source: Dominion Bureau of Statistics.
a/ Not available separately, included in other.
b/ Not available.

In each of the last two years raspberries have ranked second to strawberries in the size of pack among frozen fruits. About half of the frozen raspberries are packed in consumer packages (one pound and under). Most of the remainder is used in the manufacture of jam.

Almost all of the frozen cherries packed find reprocessing and institutional uses. Production of pie filler is probably the principal use, but substantial quantities of frozen cherries are sold direct to bakeries, restaurants and other institutional users.

A large part of the frozen blueberries produced in Canada is exported to the U.S.A. They are probably used mainly by bakeries and other institutional users for pies, as most of the fruit is packed in

large containers. Very little, if any, frozen apples have as yet been retailed. This product is used in the production of pie filler and pies.

Vegetables.- Peas account for over two-thirds of the frozen vegetable pack. They are undoubtedly the biggest seller in retail containers of any frozen fruits or vegetables produced in Canada. Large quantities are also used in the production of soups. Other uses include the production of baby foods, canned stews, frozen pot pies, TV dinners and frozen mixed vegetables.

In 1954 green beans ranked second to peas in importance among frozen vegetables, but in each of the last three years considerably more frozen corn than beans has been produced in Canada. Both frozen beans and corn are used in the same ways as frozen peas, although less popular for most of these uses.

Large-scale production of frozen french fried potatoes did not commence in Canada until 1954. However, it appears likely that this product will soon rank second to frozen peas in volume packed. To date almost the entire pack has been put up in small containers designed for sale in retail stores and through food plans.

ORGANIZATION OF PRODUCTION

Since most fruits and vegetables frozen are very perishable, packaging and freezing operations have been established in the areas of commercial production. In Canada, these areas are generally small and widely distributed across the country.

Some firms have packed and frozen, large quantities of potatoes, apples, and blueberries at considerable distances from the point of production and near utlimate markets. However, large quantities of blueberries and potatoes are also frozen in or near areas of commercial production.

The processing of frozen fruits and vegetables involves a number of steps which commence with harvest on the grower's farm. Cleaning, sorting and other prepration for freezing takes place at the packer's plant. The produce is usually packaged before freezing, but some vegetables and berries may be frozen before packaging. In either event produce is usually moved from the freezer to another room for storage. Retail packages are packed in shipping containers for storage. Produce frozen before packaging may be put in either final sales packages or large storage containers such as 50-pound bags before storage. Frozen blueberries are sometimes stored loose in bins.

Major producing areas.- British Columbia is the leading province in the production of frozen fruits and vegetables. In 1955, 53 per cent of the reported Canadian production of frozen fruits and 36 per cent of that of frozen vegetables occurred in British Columbia. In 1956, British Columbia's share of the frozen fruit pack dropped sharply as a result of the severe frost in November 1955, but her share of the frozen vegetable pack increased to 42 per cent. The frozen fruit pack in British Columbia will undoubtedly increase from the low 1956 level during the next few years if weather

conditions are favorable. The greater part of the frozen fruits and vegetables processed in British Columbia is produced in the lower mainland area extending from Chilliwack to the coastline. Relatively small quantities are produced on Vancouver Island in the interior.

Ontario is the second most important province in the production of frozen fruits with slightly over a third of the total output in 1955. Over 90 per cent of the frozen cherry pack and all the peach pack was put up in this province. This fruit is grown in the Niagara peninsula but much of the freezing is carried out in cold storage plants in Hamilton and Toronto. Ontario is also the leading producer of frozen apples and frozen rhubarb.

Among vegetables Ontario produces all the frozen lima beans and well over half of the corn. As this province also produces a considerable quantity of frozen peas, it accounted for 29 per cent of Canada's frozen vegetable production in 1956. There are several canning crop areas in Ontario where one or more firms have undertaken freezing operations. The most important of these in terms of volume of pack are the Trenton-Deseronto, Brantford and Chatham-Leamington areas.

The irrigated areas near Lethbridge have become an important source of frozen vegetables. Peas, corn, beans, french fried potatoes, pumpkin and squash are frozen in this area. Very little frozen fruit is produced in the Prairie Provinces.

It is probable that Quebec produces over half of all the blueberries frozen in Canada, but full data are not available on this product. Quebec also ranks second to Ontario in the packing of frozen apples. Almost all the frozen fruit produced in Quebec, other than blueberries, is packed in or near Montreal and Quebec City.

The production of frozen fruits and vegetables other than blueberries and strawberries had not attained any significance in the four Atlantic Provinces up to the end of 1956. In that year, 15 plants at widely separated points in this region reported packing frozen fruits. Most of these plants packed either blueberries only or strawberries only. Their pack amounted to 13 per cent of the total Canadian output in 1956.

A large new plant for the packing of frozen vegetables was opened in New Brunswick late in 1956 and it is expected that another large plant will commence operations in Prince Edward Island in the spring of 1958. These plants will probably make the Atlantic Provinces an important source of certain frozen fruits and vegetables in the future.

Number and Size of Packing firms.- The number of firms reporting production of frozen fruits and vegetables to the Dominion Bureau of Statistics has varied between 64 and 92 since 1952 (Table 3). At least one firm in each province has packed fruits, vegetables, or both for freezing in some years. However, over half of all these packers are located in two provinces, Ontario and British Columbia. Although the largest number of plants are located in Ontario, British Columbia

has the largest total pack of both frozen fruits and frozen vegetables.

Table 3.- Regional distribution of firms[a] packing vegetables for freezing in Canada, 1952-56

Year	Maritimes	Quebec	Ontario	Prairies	British Columbia	Canada
			- number -			
1952	7	9	29	2	17	64
1953	11	13	37	3	24	88
1954	11	8	33	3	23	78
1955	12	11	32	3	22	80
1956	14	16	32	5	25	92

a/ Firms with plants in more than one province are counted for each province where they pack for freezing.

Over a third of all Canadian packers of frozen fruits and vegetables operate on a very small scale, packing less than 100,000 pounds each in most years (Table 4). Such packers are found in all regions. Some of these small-scale packers are co-operative organizations of berry growers who sell most of their fruit in the fresh market; their freezing operations provide an alternative outlet if harvesting or marketing difficulties arise. Others are cold storage and canning companies which pack some frozen foods as a side line. However, frozen food operations of less than 100,000 pounds actually account for less than five per cent of the Canadian pack of frozen fruits and vegetables.

Table 4.- Firms[a] packing fruits and vegetables for freezing in Canada classified by volume of pack 1952-56

Year	Volume of pack in thousand pounds: Under 100	101 to 500	501 to 1,000	1,001 or more	Total number of firms
			- number of firms -		
1952	28	26	4	6	64
1953	37	25	16	10	88
1954	24	26	16	12	78
1955	26	28	10	16	80
1956	38	31	11	12	92

a/ Firms with plants in two or more provinces are counted as separate firms in each province where a plant is located.

Another third of the packers of frozen fruits and vegetables pack between 101,000 and 500,000 pounds a year. This group of firms includes several jam manufacturers who pack fruit to be frozen and subsequently used in jam. Some of these firms pack vegetables, but only a small portion of their entire pack is put up in retail packages.

The small group of firms packing over a million pounds each account for well over half the total pack. In 1956 these 12 firms packed 31.8 million pounds of frozen fruits and vegetables or 63 per cent of the total pack.

Purchase of raw materials.- Fruits and vegetables for processing are usually delivered directly by the grower to the packer. Transportation from the field to the packer's plant may be arranged by either the producer or the processor.

It is the usual practice for a processor to sign agreements or contracts with fruit producers or their representatives in advance of the harvest of the crop. The purpose of such contracts is to provide assurance of the necessary supplies. In British Columbia much of the berry crop is sold through grower's marketing co-operatives. Contracts with growers who are not members of these co-operatives are based on the prices secured by the co-operatives. In Ontario, marketing boards represent the growers in negotiating the terms under which cherries and a number of other fruits are sold to processors.

Packers of peas, beans and corn find considerable control over the production of these crops necessary to efficient packing operations. This control is obtained through acreage contracts which enable the packer to set seeding dates. The grower contracts to sell the product of a specified acreage to the packer and to manage this acreage in accordance with the packer's requirements. In Ontario and British Columbia the general terms of these contracts are negotiated by marketing boards.

Even greater control of cultural practices may be obtained by either renting or owning the land used. Some packers, both small and large, own most of the land used for the production of the vegetables which they freeze but it is a less common practice for a packer to own or rent fruit land.

On the other hand, packers of potatoes, blueberries, apples and other tree fruits who obtain supplies at a considerable distance from their plant often buy on the open market in the sense that they do not contract with growers for supplies. Nevertheless, such firms are likely to contract with a co-operative organization or dealers to secure a steady flow of produce during their processing season.

Quality requirements for freezing.- In general, the nature of the end product desired determines the quality of raw material used in freezing operations. For the fancy grade in frozen fruits and vegetables similar produce will be used as for the production of fancy quality canned goods. However, the best canning varieties are not necessarily the best freezing varieties. Thus, with peas, special varieties have been developed which are grown for freezing purposes only. With most other fruits and vegetables the same varieties are used for canning as for freezing.

Frozen fruits and vegetables packed for reprocessing are usually packed according to the user's specifications. With berries the require-

ments are likely to be identical to those for jam manufacture. The lower grades of apples are usually bought for freezing. The manufacturers of soups and stews like peas which are somewhat too mature and firm for the fancy grade, as the more mature peas stand up better under cooking.

Duration of the packing season.- For peas, beans, corn, strawberries, raspberries, blueberries, and cherries the harvest and packing season are identical. This is also true with respect to most of the other fruits and vegetables which are frozen. The packing season can differ from the harvest season only for less perishable products, such as potatoes and apples.

By careful selection of early and late varieties and timing of seeding operations a packer of the vegetables named can make the harvest season for each of them last about six weeks in a normal year. Moreover, these seasons tend to fall in sequence in most parts of Canada, so that a firm packing all three of these vegetables may have a packing season of 15 to 18 weeks.

The packer cannot influence the length of the harvest season for any of the fruits. Each fruit is harvested during a period of from three to six weeks. The harvest season for berries and cherries overlaps that for the vegetables named, although the picking of strawberries for freezing will usually commence two or three weeks before peas become available.

There are some vegetables such as asparagus and spinach which can be packed for freezing before strawberries and peas are harvested but the demand for the frozen product in these vegetables is still quite small. The same considerations apply to such late vegetables as broccoli and squash.

Apples and potatoes are packed for freezing during relatively long seasons. In practice, a firm packing apples for freezing is likely to carry out this operation in the fall and winter months. Potatoes are also packed for freezing throughout the fall and winter months.

These limitations of the harvest season determine the packing season for Canadian firms in the frozen fruit and vegetable industry. Some plants pack only one fruit or one vegetable and are thereby limited to a season of six weeks or less. These are mostly small concerns. The larger firms pack several products and consequently most of them have a continuous packing season of three months or more. A few achieve continuous year-round operation by packing prepared foods as well as fruits and vegetables.

However, attainment of year-round operations does not mean that plant facilities will be used continuously at or near capacity. Indeed, it is unlikely that any packer of frozen fruits and vegetables utilizes his full plant capacity more than a few days a year.

Data were secured on the daily pack of seven firms in 1955. It was assumed that the daily packing capacity of each of these firms was at least as great as the largest quantity of produce packed on one day. On this basis none of these firms operated at a level higher than 80 per cent of its packing capacity more than 13 days in 1955.

In Table 5 these daily pack data are summarized for the leading product only, for plants A, B and C, and for all products for plants D, E and F. The packing seasons for the leading product of plants A, B and C varied between 24 and 36 days. However, these three plants had only four to 16 days on which they were able to pack at a rate in excess of 60 per cent of their daily capacity.

While it is possible that some packers of frozen fruits and vegetables in Canada have done better than plant C in this regard, there are good reasons to expect the situation to be normal. The rate of maturation of a fruit or vegetable crop depends on weather conditions. Cool cloudy weather leads to slow development but hot, bright days lead to rapid ripening. Consequently, with a canning crop a spell of cool weather can delay the harvest period several days beyond the expected date or a heat wave can bring it on earlier than planned. Thus, although the packer has scheduled planting for a uniform flow of product over a period of four to six weeks, weather conditions usually disrupt this flow. Fields which are scheduled to mature several days apart may have to be harvested on the same day, if maximum quality is to be achieved.

Table 5.- The number of days on which selected packers of frozen fruits and vegetables attained various percentages of their peak daily pack in 1955

Percentage of peak daily pack attained	Plant					
	A[a]	B[a]	C[a]	D	E	F
	- number of days -					
80.1 - 100	2	7	13	7	13	7
60.1 - 80.0	2	4	3	6	7	16
40.1 - 60.0	11	10	5	16	6	12
20.1 - 40.0	3	6	6	7	11	10
0.1 - 20.0	6	9	3	16	31	59
Total days of operations	24	36	30	52	68	104

a/ Data for leading product only.

The data for plants D, E and F illustrate how packing an assortment of fruits and vegetables lengthens the packing season. Plant F actually packed over ten different fruits and vegetables. It is noteworthy that none of these plants managed to do better than plant C in number of days on which it was operated at over 80 per cent of capacity. However, they averaged more days than plants A, B and C in each of the other levels of operation tabulated. The reason for this is that a firm packing a wide

variety of fruits and vegetables usually has a much larger pack of one of these than any other. Consequently, the plant operates at full capacity only when it is packing its leading product.

Data on daily pack were obtained for eight months for one other plant that operated on a year-round basis. This plant packed over 80 per cent of its peak daily pack on only three days. It did not attain 20 per cent of its peak daily pack on a single day between January 1 and June 20. It could have undoubtedly done so by packing large quantities of apples, french fried potatoes or other prepared foods, but as yet Canadian sales of these frozen products are much smaller than those of frozen peas or strawberries. Moreover, a packer located in an area of commercial production of canning crops or berries is likely to find his location somewhat unfavorable to compete in the packing of these products. Consequently, it is unlikely that many Canadian packers of frozen fruits and vegetables will ever use their plants to capacity more than a few days a year.

Division of processing operations.- The preparation of fruits and vegetables for freezing is a separate operation from the actual freezing. These two operations can and often do take place in different plants. Indeed over a third of the fruits and vegetables frozen in Canada are hauled varying distances from the "preparation" plant to the freezing plant, (Table 6).1/ Often this haul is short but in some instances it has exceeded 50 miles.

Table 6.- Proportion of 1956 pack for various frozen fruits and vegetables packed by firms which shipped product from various distances to freezing plant

Product	Distance from preparation[a] to freezing plant				
	None	0.1 - 5.0 miles	5.1 to 20 miles	Over 20 miles	Not known
	- pack as per cent of 1956 pack -				
Peas	52.5	34.0	4.6	8.4	0.5
Corn	52.1	13.3	20.7	13.9	0.0
Beans	55.6	40.0	0.0	2.9	1.5
Others	85.3	0.0	0.0	0.0	14.7
Total vegetables	56.2	27.8	6.1	7.9	2.0
Strawberries	20.6	14.6	7.3	11.2	46.3
Raspberries	46.9	4.0	6.1	28.4	14.6
Cherries	18.8	17.7	0.0	23.0	40.5
Blueberries	42.0	5.6	0.9	0.0	51.5
Others	46.9	14.5	0.0	11.8	26.8
Total fruits	29.4	12.5	4.3	16.0	37.8

a/ Plant at which the raw fruit or vegetable was prepared for freezing.

1/ Here and subsequently in this report the term "preparation" plant is used to distinguish the plant where fruits and vegetables are prepared for freezing from the one where they are frozen.

The extent to which preparation and freezing operations are separated varies considerably with products. Firms which pack fruits with sugar in large containers for freezing and do not pack other products for freezing, seldom provide their own cold storage facilities. The sugar has sufficient preservative action to prevent deterioriation for at least a few hours. This provides the necessary time for transportation over a considerable distance. As the needof such firms for cold storage facilities is highly seasonal, they generally find it more economical to rent freezing and storage space than to own it.

A considerably larger proportion of the fruit packed in containers of one pound and under is frozen at the preparation plant than of the fruit packed in larger containers. Probably onereason for this is that a smaller proportion of the consumer pack than of the institutional and reprocessing packs is put up by firms packing less than a million pounds a year. A large-scale packer is more likely to be able to realize savings through ownership of his own freezing facilities than a small-scale operator.

Quality considerations are an important deterrent to the shipment of vegetables from a preparation plant to a freezing plant. It is important to freeze, or at least chill, vegetables as soon as possible after preparation.

Some vegetable packers operate plants quite close to public cold storages. Most of these firms use the public facilities for freezing. Where the haul is less than a mile, as it is in several cases, it is probable that the product enters the freezer almost as soon after preparation as where preparation and freezing are carried out in the same plant.

However, the data of Table 6 reveal that some packers do haul vegetables a considerable distance from the preparation to the freezing plant. It is probable that these packers find it difficult to attain a high level of quality without incurring excessive transportation costs. Nevertheless, 13 per cent of the peas and 35 per cent of the corn frozen in 1956 was hauled over five miles from the preparation plant to the freezing plant.

Officers of some of the firms with relatively long hauls indicated that such arrangements were intended to be temporary and had arisen out of rapid expansion of the frozen vegetable industry. In their opinion, a firm had to build its own freezing facilities or else make arrangements for facilities near the preparation plant to become well established in the frozen food industry.

Storage by packers.- Those packers who rent freezing facilities for fruits and vegetables also rent storage facilities. The usual freezing contract includes 30 days storage and some packers sell the frozen produce to a distributor or other buyer before this period expires. Others make continuous use of public cold storage facilities. These firms will gradually withdraw their product from storage as it is used or sold. They will usually endeavor to reduce their stocks to zero for each product by the time a new packing season for it commences.

Firms which operate their own freezing facilities may or may not store all their own product. Some of these firms operate public cold storage plants and accordingly have facilities for the storage of a much larger quantity of frozen food than they produce. Such firms are relatively small-scale producers of frozen fruits and vegetables.

However, a number of the packers of frozen fruits and vegetables who have private cold storage plants do not have sufficient storage space for all of their own product. This group includes a number of the larger packers. They find little advantage in being able to store all their output in their own facilities as their storage space requirements decline rapidly after the end of the packing season. It is probably cheaper to rent some public cold storage space than to provide space for use only two or three months a year.

CAPACITY AND POTENTIAL EXPANSION

The existing organization of the frozen fruit and vegetable industry in Canada has been described in the foregoing sections. This industry has grown up naturally in the areas of commercial fruit and vegetable production. Many of the firms in the industry also can fruits and vegetables.

During the past few years the production of frozen fruits and vegetables has increased rapidly. Consequently, the question arises whether the present productive capacity of the industry is being fully utilized and if so how likely is this capacity to expand under prevailing conditions. There are four facets to the capacity of this industry, namely; ability to grow the necessary raw materials, packing capacity, freezing capacity and storage capacity. Output may also be limited by marketing problems.

Availability of fruits and vegetables.- Canada's capacity to produce different fruits and vegetables efficiently varies greatly. She can compete in export markets with some and imports her entire supplies of others.

Among the leading frozen fruits and vegetables there are three of which Canada does produce an exportable surplus. These are apples, blueberries and potatoes. Firms freezing these products should have little difficulty in obtaining sufficient supplies to meet domestic requirements. Indeed Canada is an exporter of frozen blueberries.

Before the expansion in use of frozen food, Canada produced about as much peas, beans, and corn as she consumed. Some fresh peas, beans and corn are imported when these vegetables are out-of-season for Canadian farms. These vegetables in canned form are both imported and exported but the volume of such trade is normally very small relative to Canadian output. As freezing varieties thrive under the same soil and climatic conditions as canning varieties, it is no more difficult to produce Canadian requirements for freezing than it is for canning. Total Canadian requirements are increasing with population but there is little doubt that there is ample suitable land available for the production of these vegetables.

Areas of commercial production of raspberries in Canada are very limited. Nevertheless, Canadian production has generally sufficed to fill domestic demand and it is unlikely that the introduction of frozen preservation has improved the competitive position of foreign producers relative to Canadian producers.

Canadian ability to supply domestic requirements for strawberries and cherries at competitive prices is less certain. Imports of these two fruits in all forms have been considerably greater than exports in most recent years. These imports have occurred despite the existing tariff protection for Canadian growers. Moreover, the rapid growth of cities in the vicinity of the major areas of commercial production of these fruits is absorbing much of the best land. However, little is known about the possibility of new areas of commercial production developing, especially for strawberries.

Lima beans have been successfully produced for both canning and freezing in southwestern Ontario. However, the volume of production is still small and there is considerable doubt whether it is possible to produce this vegetable efficiently in Canada in view of climate factors.

Other fruits and vegetables which can be produced in Canada have as yet found very limited markets in the frozen form.

Preparation for freezing.- It is difficult to evaluate the capacity of the Canadian frozen fruit and vegetable industry to prepare produce for freezing. It differs greatly for each fruit and vegetable and according to type of pack.

A considerable proportion of the fruits and vegetables frozen are prepared in canning factories. In a number of such plants the volume of produce prepared for freezing is only a small percentage of the total volume processed. In many such plants a shift from the preparation of fruits and vegetables for canning or jam to freezing would require little if any added investment.

The volume of consumer and institutional pack of various fruits and vegetables is more likely to be limited by preparation facilities than that of reprocessing pack. It is a common practice to fill consumer containers before freezing and the packaging operation is mechanized. Different machinery is required to assemble, fill and seal frozen food cartons than that used in the canning line. Thus the capacity of the machinery in the "freezing" line may definitely limit the plant's output.

Interviews in 1955 suggested that most of the leading processors of frozen peas had that year used their production lines for the preparation of freezing peas at or near capacity. Only three of the ten leading packers appeared to have fallen significantly short of full utilization of their capacity in this regard. Some of the smaller packing plants may not have used all their capacity for the preparation of peas but these plants accounted for only a small fraction of the pack of frozen peas.

Less definite data were obtained with respect to facilities for the preparation of other fruits and vegetables for freezing. However, there was no suggestion that the pack of frozen beans, corn, strawberries, raspberries, blueberries or cherries was being limited by a lack of factory facilities for their preparation.

The situation with respect to apples and french fried potatoes is quite different. Lack of plant facilities in which to prepare these products for freezing probably did limit the pack before 1955. However, the capacity for preparing these products for freezing was sharply increased in 1955. A further substantial increase in capacity for preparing french fried potatoes has since taken place. It appears doubtful that the capacity attained in 1955 for the preparation of apples for freezing has ever been fully utilized.

Freezing capacity.- It is more likely that freezing capacity rather than preparation capacity limits the output of frozen fruits and vegetables in Canada. Freezing capacity is the more difficult to expand in that it does not suffice to install refrigeration equipment in a canning plant. Special insulated rooms have to be built. Consequently, the required investment is usually larger than for an expansion of canning capacity and the time lag between decision to expand and actual use of new facilities is likely to prove longer.

It would appear probable that most of those packers of fruits and vegetables who owned their own freezing facilities used these facilities to capacity in 1955, or came near doing so. This is true only if use to capacity is considered to occur when the peak daily pack equals the daily freezing capacity. Most, if not all of these firms, would have considerable excess freezing capacity at other times than the peak of their packing season. However, such excess capacity is not available for an increase in the output of the firm's major product. For berries and canning vegetables especially, it is ability to handle the product as it becomes ready for harvest that counts.

Information obtained from firms packing more than 500,000 pounds in 1955 would indicate that four of them had capacity to freeze considerably more of their principal product than they used. This excess capacity appeared to rise mainly from recent expansion of freezing facilities owned by these firms.

Some smaller firms have their own freezing units and may not have used these to capacity. However, it is doubtful that much significance can be attached to this excess capacity. Even if all the firms packing under 500,000 pounds of frozen fruits and vegetables doubled their consumer pack the increase in this pack would not be more than three per cent.

A total of eight firms that did not own any freezing facilities put up over 50,000 pounds each of frozen fruits and vegetables in 1955 in consumer packages. These included some of the largest packers in the industry. The adequacy of freezing facilities available to these firms was difficult to assess in view of alternative uses of these facilities.

However, it is significant that three of them were each using facilities in two or more different cold storages. It is doubtful that any of these three firms could have arranged to have more product frozen at the facility used nearest to the packing plant. Another one of them was considering building its own facility.

In summary, it would appear that with few exceptions firms putting up frozen fruits and vegetables in consumer pack fully utilized freezing facilities available to them in 1955. The exceptions arose where freezing facilities had been recently expanded and output had not yet caught up with the new freezing capacity.

The picture is quite different with respect to firms packing fruits for reprocessing. These firms require less specialized freezing facilities and run less risk of loss of quality during transit of packed unfrozen product to a cold storage warehouse. They usually freeze and store their product in large commercial warehouses. The product offered by individual fruit packers does not tax the freezing capacity of these warehouses. Nevertheless, there are occasions when the freezing rooms of specific warehouses are loaded to capacity and packers have to go to some other less convenient plant for service.

Storage capacity.- All the firms which own quick freezing facilities for fruits and vegetables also have some storage facilities. However, nine of these firms including six with packs in excess of a million pounds each, rented storage space in 1955 to supplement their own facilities. Indeed, among the 16 plants which packed over a million pounds of frozen fruits and vegetables only three belonged to firms which owned storage capacity for their entire output.

On the other hand, a number of the smaller scale packers did not need all their storage space for their own pack of frozen fruits and vegetables. This group included most of the firms studied in the Atlantic Provinces. Some of these firms were primarily in the cold storage business, with a sideline of packing blueberries. In a number of instances fish was the main product frozen and stored.

There is some difficulty in appraising the adequacy of cold storage facilities available for frozen fruits and vegetables. Total public freezer capacity in Canada in 1955 has been estimated at about 25 million cubic feet.1/ In addition, there is private warehouse space for frozen foods in excess of nine million cubic feet.2/ This is enough storage space to hold at least ten times the 1955 pack of frozen fruits and vegetables.

However, there are many other frozen products stored in this space. Consequently, the over-all adequacy of available space from the view point

1/ Fitzpatrick, J.M., Public Cold Storage Facilities in Canada. The Economic Annalist. Canada Department of Agriculture, Ottawa. Vol. XXVI, No. 3. June 1956. p.60.

2/ Directory of Cold Storage Warehouse in Canada. Canada Department of Agriculture, Ottawa. 1953. p.7.

of the frozen fruit and vegetable packer depends on the extent to which this space is being used for other products at the time he wants it. Moreover, there may be plenty of vacant storage space in Canada as a whole, but not at the place where it is needed.

This matter of location of storage appeared to present a problem to the frozen food packers of the Niagara Peninsula and the Fraser River Valley. There are large public cold storage plants in cities within a radius of 80 miles of both these areas. Although the rental of storage space in large cities has certain advantages from the viewpoint of distribution, at least some of the packers in both of these two areas considered that more conveniently located cold storage plants were badly needed.

It is by no means certain, however, that lack of convenient public cold storage space was limiting output of frozen fruits and vegetables in these two areas. This lack tended to increase the relative efficiency of those firms which provided their own private cold storage space. The remaining firms were probably more seriously handicapped by lack of convenient freezing capacity than lack of storage capacity.

Marketing difficulties.- Although consumption of frozen fruits and vegetables as increased rapidly in the last few years, processors do experience some marketing problems. One of the most serious of these is that of transportation. Canada's main surplus producing area for frozen fruits and vegetables is in Alberta and British Columbia over 2,000 miles from the large centers of population in Ontario and Quebec. Thus, the cost of transportation looms very important to this industry.

Another major marketing problem relates to the cost of distribution of frozen foods to stores. Few retailers as yet provide back room storage for frozen foods, so daily deliveries are often necessary where a store has a good frozen food business. In general, the average delivery to retail stores is too small for optimum efficiency in distribution, especially considering that refrigerated trucks are required.

Another feature of distribution is the problem of supplying smaller centers, many of which lack frozen food storage facilities. Frequent small shipments by refrigerated trucks are necessary to give adequate service. Transportation costs for such shipments are usually relatively high.

Shortage of retail store cabinet space presents a real problem to the firm which is endeavoring to market its own brand of frozen foods. While such space is rapidly increasing, the variety of frozen foods is also increasing so that space available for specific products remains limited.

Supermarkets and chain-stores have the bulk of the retail cabinet space. These firms usually require assurances of continuous supply in substantial quantities before they will accept a given brand. A small-scale packer is in no position to give such assurances. Consequently, if he wishes to put out a consumer pack he may be forced to enter a co-packer arrangement with the distributor of some national brand.

A number of frozen fruit and vegetable packers referred to a lack of demand when interviewed. This may appear strange in view of the rapid expansion of frozen food sales in the last few years. However, individual firms may have failed to capitalize on this growth in the Canadian market for frozen fruits and vegetables, and now face the problems in building a market for their products in competition with imported brands which have gained popularity.

Potential expansion.- The Questionnaire used in 1955 did not make any direct inquiry as to the individual firm's plans with respect to increasing its output in the future. However, deterrents to expansion of the frozen fruit and vegetable industry were discussed in some detail. This led to discussion of the potential expansion of the frozen fruit and vegetable industry.

The general concensus was that the output of frozen fruits and vegetables in Canada would expand very rapidly. There was an expectation that consumption of frozen fruits would continue to increase. Nevertheless there was some concern lest production increased too rapidly, leading to a surplus problem in a few years.

The expressed conviction that production of frozen fruits and vegetables would expand was generally backed up with statements as to the individual firm's own plans. No effort was made to obtain such statements from all firms visited. Nevertheless, officers of 20 firms mentioned an intention to expand their output within the next two or three years. No early expansion was planned in another 17 firms, indeed two or three of these firms expected to curtail output.

The firms which planned to expand accounted for 84 per cent of the consumer pack of frozen vegetables in 1955 (Table 7). The no-data group (Table 7) includes one of the largest packers of frozen vegetables in Canada. It is quite probable that this firm was also considering expansion.

Table 7.- Proportion of 1955 pack of frozen fruits and vegetables put up by firms with various intentions of expansion

Class of pack	Plan to expand	Do not plan to expand	No data on intentions [a]
	- number of firms in group -		
	20	17	43
	- per cent -		
Consumer pack - Vegetables	84.0	0.5	15.5
Total pack - Vegetables	55.2	17.5	27.3
Consumer pack - Fruits	67.5	11.2	21.3
Total pack - Fruits	33.9	10.8	55.3

a/ Includes firms that were not visited as well as those which failed to make any statement relative to their plans for expansion.

Firms that did not plan to increase their output during the next few years included two of the largest packers of vegetables for reprocessing. It is probable that Canadian production is meeting full requirements for this purpose and that the volume used will not increase rapidly.

Most of the leading packers of frozen fruits insmall containers also planned to expand their output. These firms are for the most part in the group of leading vegetable packers.

A comparison was made of production of frozen fruits and vegetables in 1955 and 1956 for these firms, which in 1955 indicated an intention to expand. Ten of them had packed frozen vegetables in 1955 and every one of these firms increased their pack of frozen vegetables in 1956. The total increase amounted to 3.1 million pounds, distributed as follows: peas 1.3 million pounds; corn 1.0 million; beans, 0.5 million pounds; others, mostly french fried potatoes; 0.3 million pounds. As the total pack of frozen vegetables in 1956 increased by 3.9 million pounds it is apparent that these firms accounted for most of the increase in the total pack.

On the other hand, most of these firms reduced their pack of frozen fruits in 1956. The reduction in their strawberry pack was especially sharp and amounted to 2.8 million pounds. Their raspberry pack was also down 1.3 million pounds. Reduced supplies of these fruits was undoubtedly a major factor in this reduction of pack.

As to frozen cherries and blueberries, firms which intended to expand in 1955 did register a small increase in production in 1956. This is especially significant in view of the decline in the total frozen packs of these fruits.

In summary, firms which expressed in 1955 an intention to increase their production of frozen fruits and vegetables did effect increases in output of frozen cherries, blueberries and each major vegetable. They did not increase their output of frozen strawberries, raspberries and apples, but their failure to do so was caused by conditions over which they had no control.

COMPETITIVE POSITION

The Canadian frozen fruit and vegetable industry has utilized its capacity more fully in recent years for the production of some products than others. Reduced crops in 1956 of the principal fruits frozen was probably the main cause of the decline in the frozen fruit pack in that year, even though the greater part of each class of fruit produced in Canada is not frozen in any year.

With respect to frozen vegetables, it is probable that the industry has been fully utilizing its existing packing and freezing capacity in recent years. This capacity has been increasing and will probably continue to do so.

However, the ultimate size of the Canadian frozen fruit and vegetable industry will probably depend on:

1. Canadian demand for frozen fruits and vegetables.
2. The ability of Canadian processors to meet this demand at competitive prices with imported products.

If Canadian processors of specific frozen products can satisfy Canadian requirements at competitive prices, foreign markets may add to the potential demand for these products. However, so long as Canada is a net importer of a given product it is unrealistic to assume that Canadian producers can compete effectively on foreign markets.

Domestic utilization of frozen fruits and vegetables.- The domestic utilization of frozen fruits increased as rapidly as production from 1952-53--1955-56 (Table 8). In this period production increased by 9.9 million pounds and domestic disappearance by ten million pounds. Production declined sharply in 1956, largely as a result of severe frost in the British Columbia lower mainland in November 1955. Imports increased sharply and domestic disappearance declined by almost two million pounds.

Table 8.- Apparent domestic disappearance of frozen fruits, (excluding blueberries and juices) in Canada, Crop years a/ 1952-53 to 1956-57

	1952-53	1953-54	1954-55	1955-56	1956-57
	- thousand pounds -				
Stocks, June 1	10,956	6,651	9,846	11,650	13,534
Production b/	15,496	22,060	25,791	25,356	16,097
Imports	1,484	5,531	3,604	7,666	13,624
Total supply	27,936	34,242	39,241	44,672	43,255
Exports	169	233	165	51	c/
Stocks, May 31	6,651	9,846	11,650	13,534	14,034
Domestic disappearance	21,116	24,163	27,426	31,087	29,221

a/ June 1 to May 31.
b/ Calendar year data used.
c/ Less than 500 pounds.

The production of frozen vegetables increased more rapidly than that of frozen fruits from 1952-53 to 1955-56. Moreover, a further substantial increase was registered in 1956-57. Nevertheless, disappearance increased even more rapidly than production (Table 9). This more rapid gain in domestic disappearance was made possible by an increase in annual imports from 5.0 million pounds to 24.4 million pounds.

Table 9.- Apparent domestic disappearance of frozen vegetables in Canada, crop years a/ 1952-53 to 1956-57

	1952-53	1953-54	1954-55	1955-56	1956-57
			- thousand pounds -		
Stocks June 1	5,338	5,839	11,808	8,404	11,100
Production b/	14,475	20,720	18,360	28,550	32,497
Imports	4,962	10,467	11,590	17,188	24,367
Total supply	24,775	37,026	41,758	54,142	67,964
Exports	469	-	17	211	35
Stocks May 31	5,839	11,808	8,404	11,100	17,956
Domestic disappearance	18,467	25,218	33,337	42,831	49,973

a/ June 1 to May 31.
b/ Calendar year data used.

Per capita consumption.- The rapid gain in domestic disappearance of frozen fruits and vegetables was naturally associated with an increase in per capita consumption. The consumption of both frozen fruits and frozen vegetables as estimated by the Dominion Bureau of Statistics more than doubled between 1952 and 1956 (Table 10).

Table 10.- Consumption of frozen fruits and vegetables per person in Canada and the United States, 1952-1956

	Fruits			Vegetables		
	Canada			Canada		
	Official estimate	Including reprocessing pack a/	United States	Official estimate	Including reprocessing pack	United States
Year			- pounds per person -			
1952	0.5	1.79	6.53	0.8	1.34	5.24
1953	1.0	2.26	6.96	1.1	1.56	5.40
1954	1.2	2.74	7.35	1.5	1.91	5.85
1955	1.2	3.39	8.7	1.7	2.45	6.6
1956	1.4	3.40	8.8	1.9	3.44	7.3

a/ Excludes blueberries but includes "concentrated frozen fruit juices" at retail weight not included in the official estimate.

These official Canadian statistics are estimates of sales of frozen fruits and vegetables to ultimate consumers and institutional users. They differ considerably from figures computed on the basis of total domestic disappearance in that quantities used for reprocessing are excluded. In practice, it is assumed that any fruits packed in containers of 30 pounds or over, or vegetables packed in containers of ten pounds or over are reprocessed and the balance is sold to housewives and institutional users.

The United States procedure has been to estimate consumption per person on the basis of total domestic disappearance. With this procedure frozen fruits used for jam and frozen vegetables used for soup are included with the product sold to the ultimate consumer.

The difference in official procedures accounts for a substantial part of the difference in the official estimates of consumption per person of frozen fruits and vegetables in the two countries. Nevertheless, after adjustment to make the estimates more consistent the Canadian levels of

consumption remain less than half of the American. The adjusted per capita Canadian consumption of frozen fruits almost doubled and that of frozen vegetables more than doubled during the five-year period 1952 to 1956. Meanwhile, the comparable United States consumption increased by about one-third. The absolute increase in the consumption rate was 1.6 pounds per person in Canada and 2.3 pounds in the U.S.A. for fruits. Of the increase in frozen fruit consumption in Canada 1.1 pounds was accounted for by concentrated frozen juices. Frozen vegetable usage increased by over two pounds per person in both countries.

Imports and exports.- Exports of frozen blueberries were first reported in the middle 1930's but external trade in other frozen fruits and vegetables was not considered to be sufficient to warrant separate classification in "Trade of Canada" until 1945. In 1946 imports of frozen vegetables were reported for the first time. In 1948 the Dominion Bureau of Statistics started to report on exports of frozen fruits other than blueberries and of frozen vegetables. Data on imports of frozen fruits are available only since 1951. Concentrated frozen juices are not included in frozen fruits but are a separate import category.

Canada never has exported large quantities of frozen vegetables (Table 11). In the peak year, 1952, the exports were less than half a million pounds and only 3.2 per cent of Canadian production. On the other hand, exports of frozen fruits, have been quite substantial each year since 1947. However, the bulk of these exports has been frozen blueberries. Exports of other frozen fruits have exceeded a million pounds only in 1949; in that year they amounted to 16 per cent of the reported Canadian production.

Table 11.- Exports of frozen fruits and vegetables 1946-1956

Year	Blueberries		Other fruits		Vegetables	
	Quantity	Value	Quantity	Value	Quantity	Value
	- pounds -	- $ -	- pounds -	- $ -	- pounds -	- $ -
1946	32,500	7,312				
1947	1,436,965	234,324				
1948	2,320,128	426,560	7,788	1,693	13,416	3,088
1949	3,213,668	611,860	2,449,352	340,692	47,757	5,594
1950	4,022,489	951,909	535,352	129,366	31,793	9,378
1951	2,843,270	536,309	510,919	86,694	284,200	36,252
1952	5,367,981	1,047,514	338,193	60,550	464,039	58,915
1953	3,364,458	881,057	208,511	32,587	57,874	8,314
1954	2,985,693	653,721	260,309	42,585	16,675	2,986
1955	2,866,170	532,865	19,694	1,456	84,063	14,066
1956	1,374,319	327,088	32,687	10,161	142,776	37,549

In both 1950 and 1951 exports of frozen fruits, other than blueberries, were about half a million pounds but since 1951 they have declined to negligible proportions.

Imports of frozen vegetables were sizeable in the first two years of available data 1946 and 1947 (Table 12). They exceeded 20 per cent of domestic production both these years. From 1948-1950 imports of frozen vegetables were relatively small and partially offset by exports. However, imports have increased sharply each year since 1951. Moreover,

net imports (i.e. imports less exports) of frozen vegetables have increased as a percentage of domestic production each year, except 1955, since 1950. By 1956 this proportion had reached a high of 76 per cent of domestic production.

Table 12.- Imports of frozen fruits and vegetables 1946-1956

Year	Fruits		Fruit juices		Vegetables	
	Quantity	Value	Quantity	Value	Quantity	Value
	pounds	$	pounds	$	pounds	$
1946					1,536,952	261,000
1947					1,435,278	255,777
1948					35,712	5,355
1949					155,630	23,578
1950					43,685	4,420
1951	748,649	94,272			1,105,789	217,442
1952	1,345,697	165,485	496,638	1,352,949	2,328,310	414,375
1953	3,979,401	712,183	1,048,325	3,104,775	9,195,608	1,664,378
1954	4,415,364	840,279	1,532,426	4,025,382	11,326,465	1,781,855
1955	5,724,906	1,076,158	2,209,940	5,813,268	14,636,780	2,455,701
1956	13,132,400	2,606,737	2,410,340	6,934,334	24,948,813	4,435,465

Imports of frozen fruits were not reported until 1951, but probably were less than exports, even excluding blueberries, up to that time. Since 1951 imports of frozen fruits have increased sharply each year. In 1956 gross imports of frozen fruits equalled 74 per cent of Canadian production. If exports of frozen blueberries and other frozen fruits are deducted from the imports the foregoing percentage drops to 67.

The computations above do not take into consideration imports of concentrated frozen fruit juices. Almost all of the latter are produced from fruits that cannot be grown in Canada, such as oranges and pineapples. However, any imports of frozen concentrated grape juice are included in this figure. The imports of frozen concentrated juices represent a very substantial quantity of fruit as it takes about 70 pounds to produce a gallon of frozen concentrated juice.

No breakdown by product and size of package is available on imports of frozen fruits and vegetables until 1955. In 1955 almost half the imported fruit consisted of strawberries in packages of over one pound (Table 13). However, in 1956 the pattern changed. Strawberries accounted for over half the imports, but over half the strawberries were imported in small containers. This probably signifies that jam companies were the main users of imported frozen strawberries in 1955 but not in 1956. In the latter year it appears that a large proportion of the frozen strawberries were retailed.

Another significant development is the sharp increase in imports of frozen fruits n.o.p. from 1955 to 1956. This may well be closely related to the reduced Canadian pack of frozen cherries in 1956.

French fried potatoes is the only frozen vegetable which has been separately enumerated in import data. Imports of this product increased 50 per cent in 1956 despite an even greater increase in domestic production.

Over two-thirds of the vegetables imported in 1956 were shipped in packages of one pound or less. There can be little doubt that these vegetables were all intended for sale direct to consumers. Some of the vegetables shipped in larger containers may also have been repacked in small containers.

Table 13.- Frozen fruit and vegetable imports - by commodity, and size of package 1955 and 1956

Commodity	Size of package	1955 Quantity	1955 Value	1956 Quantity	1956 Value
		- 000 lb. -	- 000 $ -	- 000 lb. -	- 000 $ -
Raspberries	1 lb. or less	219	61	211	48
	over 1 lb.	6	1	318	78
Total		225	62	529	126
Strawberries	1 lb. or less	777	233	4,285	1,079
	over 1 lb.	2,811	523	3,760	682
Total		3,588	756	8,045	1,761
Fruits n.o.p.	1 lb. or less	215	43	568	129
	over 1 lb.	1,696	216	3,990	590
Total		1,911	259	4,558	719
All fruits	1 lb. or less	1,211	337	5,064	1,256
	over 1 lb.	4,513	740	8,068	1,350
Total		5,724	1,077	13,132	2,606
Vegetables frozen	1 lb. or less	7,946	1,499	16,770	3,132
	over 1 lb.	5,680	777	6,586	1,002
Total		13,626	2,276	23,356	4,134
Potatoes french fried frozen	1 lb.	1,011	180	1,593	302
Total vegetables		14,637	2,456	24,949	4,436
Total fruits and vegetables		20,361	3,533	38,081	7,042

Tariffs.- The substantial imports of frozen fruits and vegetables in recent years have all been subject to customs duties.

The rate of duty varies with the country of origin. However, in practice almost all of Canada's imports of frozen fruits and vegetables in recent years have come from countries for which the most favored nation rate applies. These rates are as follows:

Frozen blueberries	- 1¼ cents per pound
All other frozen fruits	- 2 cents per pound
Frozen orange juice	- 7½ per cent ad valorem
Other frozen juices	- 10 per cent ad valorem
Frozen vegetables	- 17½ per cent ad valorem
Frozen french fried potatoes	- 20 per cent ad valorem

U.S. competition.- Most of Canada's imports of frozen fruits and vegetables have been from the U.S.A. A major exception has been frozen strawberries imported in large containers from some other countries, especially the Netherlands. Accordingly, the volume of imports in recent years has raised questions relative to the ability of Canadian packers of frozen fruits and vegetables to meet the competition of their American counterparts. This question was discussed in some detail with various Canadian packers during the 1955 survey. These discussions revealed that some Canadian packers feel that this industry needs considerable added protection to enable it to grow in Canada to the scale needed for efficient operation. At the other extreme, a few contend that the appearance of American products on the Canadian market has been a good thing for the Canadian packer. In their view, the American producers have helped to develop a mass market for frozen fruits and vegetables in Canada. This makes it possible for Canadian producers to expand to a more efficient scale of operation.

In both Canada and the U.S.A. production of frozen fruits and vegetables has developed faster in the West than in the rest of the country. British Columbia and Alberta have produced in most recent years over 50 per cent of the reported Canadian pack of both frozen fruits and frozen vegetables. Likewise eight western states accounted for 86 per cent of the frozen strawberry pack and 75 per cent of the frozen pea pack in the U.S.A. in 1956.1/ The provinces and states referred to have 16 and 13 per cent respectively of the population of Canada and the United States. Thus, the main surplus producing areas for both countries are in the West. Consequently, it is the packers of Western Canada who face the keenest competition from American packers.

The packers in the Western States operate on a much larger scale than those in Western Canada. The record annual pack yet attained by a single Canadian plant is between five and six million pounds. According to American reports at least 12 plants in the Western States exceeded this level in 1956 and two plants put up between 70 and 80 million pounds each in 1956.2/ Consequently, if there is a gain in efficiency due to increase of scale of operations beyond the level of five million pounds American packers have an advantage.

Possibly the main advantage due to scale could lie in the size of parcels of land contracted for freezing crops. In the Fraser River Valley farms are usually small. It is probable that acreages per field of processing crops in the Pacific Coast state average considerably higher.

Another important consideration is relative duration of packing seasons. Because British Columbia is the only area in Canada where strawberries are packed in large volume as well as peas, beans and corn, this province has a relatively long packing season. Farther south, strawberries and early vegetables are packed even earlier, while the packing

---

1/ From Preliminary U.S. pack statistics published in Frosted Food Field, New York. December, 1956.

2/ Quick Frozen Foods, 82 Wall Street, New York. July and August, 1956.

season for late vegetables is prolonged later into the fall. Further there are possibilities of a farmer harvesting two or more crops in one year which may reduce the cost of the processing crop. Possibly of even greater importance has been the development of special high-yielding processing varieties - especially of strawberries. Another advantage to the American processor may lie in lower machinery costs.

An important factor is the cost of transportation to eastern markets. Here the American processor has a decided advantage over his competitor in British Columbia and Alberta (Table 14).

Table 14.- Comparative freight rates from certain Western areas to Toronto on frozen fruits and vegetables, September 1957

Origin of shipment	Minimum weight of carload	Freight rate
	- pounds -	- cents per 100 lb. -
Vancouver, Victoria)	60,000	235
Chilliwack, Yarrow)	24,000	310
Wynndel, B.C. Vernon)	60,000	311
Lethbridge, Taber	27,500	344
Pacific Coast States)	46,000	209

If minimum carload rates are considered, a firm shipping frozen fruits or vegetables from Canadian Pacific coast points to Central Canada pays 15 per cent more freight than a competitor shipping from the Pacific coast states. An anomaly of the Canadian freight rate structure places an even heavier handicap on the firm shipping from the B.C. interior or southern Alberta. Thus, it costs 50 per cent more to ship a carload of frozen peas from Lethbridge to Toronto than from Seattle, Washington to Toronto. Further, the Canadian shipper has to make up a larger carload than his American counterpart to enjoy the minimum freight rate.

Moreover, for the last two or three years the discount on the American dollar has favored the imported product.

Nevertheless, the picture is not altogether one-sided. Food processing industries require much labor, and wage rates are generally higher in the Western States than in British Columbia or Alberta. Also the tariff does increase the cost of the imported product. The tariff at least offsets the exchange and freight handicap on shipments to Central Canada from Western Canada as compared with those from the Western States.

Much of the frozen fruits and vegetables imported into Central Canada appears to originate in Atlantic seaboard and southern states rather than Western states. These areas are much nearer Toronto or Montreal and packers in these areas may have greater advantage than those in the Pacific states in competing with Western Canadian packers on Central Canadian markets.

The present study has provided too little information to determine conclusively whether Canadian producers of frozen fruits and vegetables are at a competitive disadvantage. It appears unlikely that they are with respect to supplying the Canadian market with any of the leading frozen vegetables produced in Canada. This is suggested by the fact that Canadian capacity to produce these frozen vegetables is expanding rapidly, even though this expansion has lagged behind the growth in consumption. Moreover, Canada does not import large quantities of these vegetables in other preserved forms, and while Canada imports them in the fresh form, such imports seldom occur during the Canadian harvest season.

The situation is different, however, with respect to strawberries, and cherries. Canada has long been a net importer of these two fruits, and the development of frozen preservation cannot be expected to improve the competitive position of Canadian producers of these fruits. To date these two fruits have accounted for the bulk of Canada frozen fruit imports other than citrus juices.